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Indian Standard

DIMENSIONS OF SQUARE CORES MADE OF MAGNETIC OXIDES AND ASSOCIATED PARTS

(First Revision)

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Indian Standard

DIMENSIONS OF SQUARE CORES MADE OF MAGNETIC OXIDES AND ASSOCIATED PARTS

(First Revision)

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DIMENSIONS OF SQUARE CORES MADE OF MAGNETIC OXIDES AND ASSOCIATED PARTS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 23 October 1981, after the draft finalized by the Magnetic Components and Ferrite Materials Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The revision of this standard has been undertaken to incorporate additional sizes of square cores and dimensions of coil formers for various sizes of square cores.

0.3 In preparing this standard, assistance has been derived from IEC Pub 431 (1973) 'Dimensions of square cores (RM-cores) made of magnetic oxides and associated parts', IEC Pub 431A (1976) 'First supplement to Pub 431 (1973)' and IEC Pub 431B (1978) 'Second supplement to Pub 431 (1973)', issued by the International Electrotechnical Commission.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies dimensions of square cores or inductors made of magnetic oxides and having compatibility with 2·54 mm printed wiring grid.

1.2 This standard also lists preferred sizes of square cores together with their dimensions as far as these are of importance for mechanical interchangeability.

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*Rules for rounding off numerical values (*revised*).

2. NOTES ON THE SQUARE CORE DESIGN

2.1 General Principles — The design of square cores, covered in this standard, is based on the following principles:

a) Square cores are especially suited for use on printed wiring boards, because it is possible to solder the wire leads of the coils directly to the pin terminations moulded in the coil former. Normally, these pins should remain within the outline of the core base;

b) Square cores are primarily used for inductors and tuned transformers, but they may also be used for broad-band transformers; and

c) The base areas are square with cut-outs for the terminal pins in two opposite corners. The winding space is annular.

2.2 Pin Locations and Base Outlines — In order to provide for the largest possible number of pins, a shortest distance between pin centres of 2·54 mm should be chosen. This may be safely handled by modern soldering techniques for miniature printed wiring. It leads to a maximum of 6 pins on the smallest cores (for example, base dimensions 10 mm × 10 mm) and up to 12 pins for a large core (base dimensions 20 mm × 20 mm). If the maximum number of pins is not required, the shortest distance between pin centres may be increased to $2{\cdot}54\sqrt{2}$ mm by omitting certain pins.

When the pins are placed on the primary grid, the sides of the core base are located at half grid spacings. This allows the neighbouring pins of adjacent cores when placed side by side to be located on parallel grid lines which are 2·54 mm apart.

2.3 Design Considerations and Dimensions — The range of base sizes is compatible with 4, 5, 6, 7 and 8 printed wiring modules of 2·54 mm. Cores of 10 or more modules may also be produced, but in that range cross cores (X cores) might be used instead.

Further aspects of the design are:

a) a maximum wall height to thickness ratio of 5 : 1,

b) a thickness of the core base sufficient to accommodate the wires terminated on the pins of the coil former, and

c) an adjuster hole diameter in accordance with IS : 6235-1971*.

Within these limitations, and assuming acceptable core heights and reasonable cut-out dimensions, the optimum inner and outer diameters of the winding space may be calculated with regard to quality $\frac{Rdc}{L}$ and hysteresis loss.

---

*Dimensions of pot-cores made of ferromagnetic oxides and associated parts.

For this calculation, currently used wall thicknesses for the coil formers have been taken into account, for example, for RM6 a flange thickness of approximately 0·5 mm and a cylinder wall thickness of approximately 0·3 mm. The effect of cut-outs on the optimum dimensions of a core may be considerable; the calculation has been based on cut-outs which suit most practical applications.

2.4 Practical Considerations — The cut-outs should preferably reach the centre boss so that the inner terminating wire may easily be led out.

In order to obtain adequate adjuster performance, the tightened tolerance on the centre hole in accordance with IS : 6235-1971* shall be used. For same sizes like RM 5, the adjuster performance may still create problems and a further tightening of the tolerance should then be considered by the manufacturers.

3. PRIMARY STANDARDS

3.1 Pin Locations and Base Outlines — These are shown in Fig. 1 in which the base is viewed on to the pins, that is, from the underside of the printed wiring boards.

The pins shall fit into holes according to the relevant Indian Standards, the nominal hole diameter being:

a) 1 mm when the shortest distance between pins is 2·54 mm, and

b) 1·3 mm when the shortest distance between pins is $2{\cdot}54\sqrt{2}$ mm or more.

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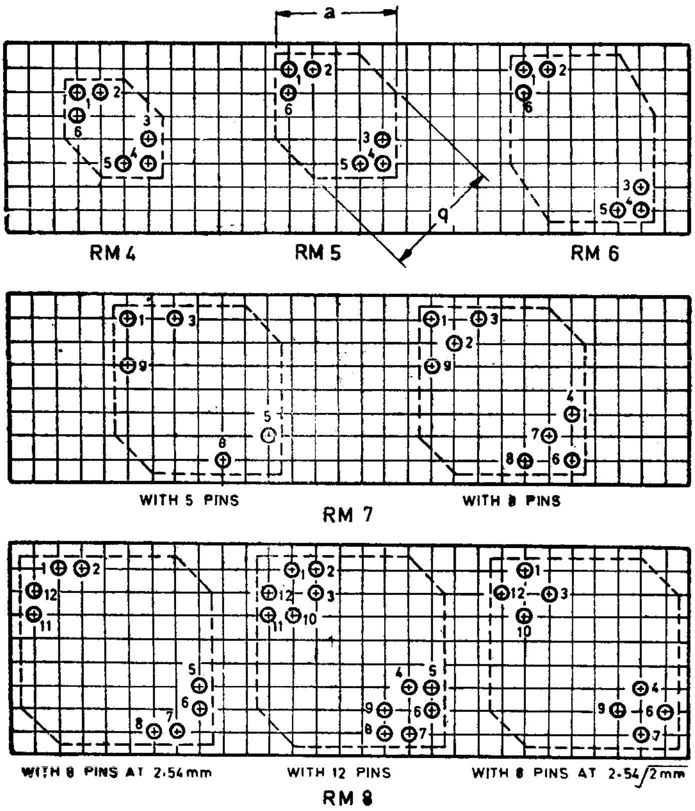
*Dimensions of pot-cores made of ferromagnetic oxides and associated parts.



NOTE 1 — To obtain an asymmetrical arrangement, one pin may be ommitted on one side from a symmetrical arrangement. For RM 7, the 5-pin version has an asymmetrical arrangement.

For the other cores, omit:

a) for RM 4, 5 and 6 : pin 4,
b) for RM 7 with 8 pins : pin 6, and
c) for RM 8 : pin 6.

NOTE 2 — For dimensions of *a* and *q*, *see* Table 1.

FIG. 1 PIN LOCATIONS AND BASE OUTLINES VIEWED FROM THE UNDERSIDE OF THE BOARD

3.2 Dimensions — The dimensions shall be in accordance with Table 1 read with Fig. 2.

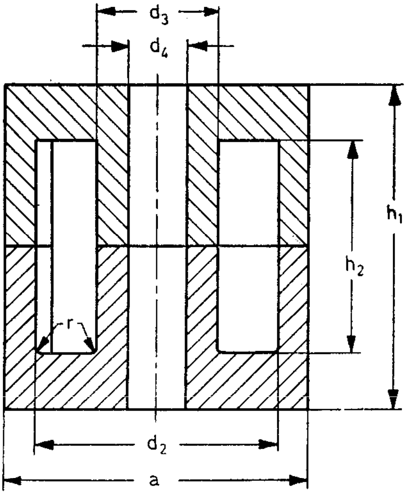


FIG. 2 DIMENSIONS OF SQUARE CORES

3.3 Dimensional Limits for Wound Coil Formers — The dimensional limits for wound coil formers shall be in accordance with Table 2 read with Fig. 3.

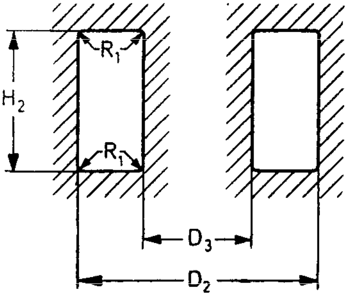


FIG. 3 WOUND COIL FORMER

TABLE 1 DIMENSIONS OF SQUARE CORES

(*Clause* 3.2, and *Fig.* 2)

All dimensions in millimetres.

SIZE	a		d_2		d_3		d_4		q	h_1		h_2		r
	Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
RM 4	9·4	9·8	7·95	8·35	3·7	3·9	2·0	2·1	11·8	10·3	10·5	7·0	7·4	0·3
RM 5	11·8	12·3	10·2	10·6	4·7	4·9	2·0	2·1	14·9	10·3	10·5	6·3	6·7	0·3
RM 6	14·1	14·7	12·4	12·9	6·1	6·4	3·0	3·1	18·3	12·3	12·5	8·0	8·4	0·3
RM 7	16·5	17·2	14·75	15·4	6·95	7·25	3·0	3·1	20·3	13·3	13·5	8·4	8·9	0·3
RM 8	18·9	19·7	17·00	17·7	8·25	8·55	4·4	4·6	23·2	16·3	16·5	10·8	11·3	0·3
RM 10	23·6	24·7	21·2	22·1	10·5	10·9	5·4	5·6	28·5	18·5	18·7	12·4	13·0	0·3
RM 14	33·5	34·7	29·0	30·2	14·4	15·0	5·4	5·6	42·2	28·8	29·0	20·8	21·4	0·3

NOTE — For definition of a and q, *see* Fig. 1.

TABLE 2 OUTLINE DIMENSIONS OF WOUND COIL FORMER

(*Clause* 3.3, and *Fig.* 3)

All dimensions in millimetres.

SIZE (1)	D_2 *Max* (2)	D_3 *Min* (3)	H_2 *Max* (4)	R_1 *Min* (5)
RM 4	7·85	4·00	7·0	0·30
RM 5	10·10	5·00	6·3	0·30
RM 6	12·30	6·50	8·0	0·30
RM 7	14·65	7·35	8·4	0·30
RM 8	16·90	8·65	10·8	0·30
RM 10	21·10	11·00	12·4	0·30
RM 14	28·90	15·10	20·8	0·30

NOTE — These dimensions define the outline of the wound coil-former. The dimensions of the unwound former will depend on the material and the method of winding specified.

3.4 Shape of Coil Former and Pin Numbering — When the coil former is viewed on to the pins, these shall be numbered in clockwise direction.

Pin 1 shall be a corner pin, or the pin immediately to the right of a corner, and closest to the base outline.

For asymmetrical arrangements, pin 1 shall be at the side with the largest number of pins.

The coil former shall show an asymmetry which shall preferably be visible (or detectable) when the assembled inductor is held with the pins downwards. This asymmetry shall clearly indicate pin 1.

For pin numbering of recommended core patterns and for recommended asymmetrical pin arrangements, *see* **3.1**.

NOTE — It is not required the pin numbers be marked on the coil former.

4. DERIVED STANDARDS

4.1 It may be found desirable to lay down derived standards for every day use corresponding to the state of the art in a particular area. These derived standards may show the dimensions in greater detail than that specified in **3**. While doing so, care should be taken that the derived standards do not violate the requirements laid down in this standard.

By way of example a possible standard for coil formers has been given in Appendix A.

APPENDIX A

(*Clause* 4.1)

EXAMPLE OF A STANDARD FOR THE MAIN DIMENSIONS OF COIL FORMERS FOR SQUARE CORES (RM-CORES)

A-1. Example of a standard for the main dimensions of the coil former for square cores (RM-cores) is given in Fig. 4 read with Table 3.

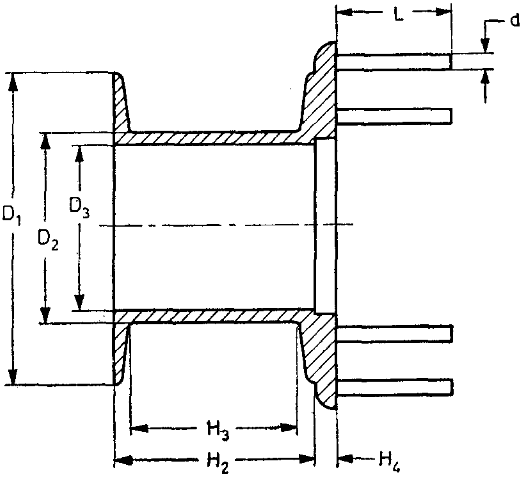


Fig. 4 Outline of a Standard for Coil Former

TABLE 3 DIMENSIONS OF A STANDARD FOR COIL FORMER

(*Clause* A-1)

All dimensions in millimetres.

SIZE (1)		RM 4 (2)	RM 5 (3)	RM 6-R (4)	RM 6-S (5)	RM 7 (6)	RM 8 (7)	RM 10 (8)	RM 14 (9)
D_1	*Min*	7·65	9·90	12·1	12·1	14·4	16·70	20·80	28·60
	Max	7·85	10·10	12·3	12·3	14·66	16·90	21·00	28·80
D_2	*Min*	4·75	5·75	7·2	7·35	—	9·75	12·30	16·60
	Max	4·05	5·95	7·3	7·45	8·3	9·95	12·50	16·80
D_3	*Min*	4·00	5·00	6·5	6·5	7·3	8·70	11·10	15·20
	Max	4·15	5·15	6·6	6·6	—	8·90	11·30	15·40
H_2	*Min*	6·65	5·95	7·7	7·7	—	10·40	12·00	20·20
	Max	6·80	6·10	7·8	7·8	8·4	10·60	12·20	20·50
H_3	approx	6·00	5·20	6·85	6·60	7·20	9·35	11·00	18·85
H_4	*Max*	0·80	0·80	0·80	0·8	1·0	0·90	1·00	1·00
L	*Min*	3·90	4·50	4·8	4·8	6·6	5·00	5·35	6·10
d	*Min*	0·50	0·50	0·58	0·53	0·78	0·58	0·78	0·75
	Max	0·60	0·60	0·62	0·57	0·82	0·62	0·82	0·85

NOTE — Formers with more number of pins are under consideration.

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Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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